5 COSTS AND OPERATIONS

5.1 Introduction

The following text replaces that contained in Chapter 4 of the 2008 Final Program EIR related to estimated capital costs resulting from changes to the San Jose to Gilroy portion of the Central Valley Corridor (Chapter 2) and the San Francisco to San Jose Corridor (Chapter 3). The changes to estimated capital costs in these two corridors result in changes to estimated costs for the Altamont Pass Network Alternatives, Pacheco Pass Network Alternatives, and Pacheco Pass with Altamont Pass (local service) Alternatives that have alignments in these corridors. The revised capital costs do not result in revisions to the operations and maintenance (O&M) costs identified in section 4.3 of the 2008 Final Program EIR. Changes to text are shown with a bar in the margin; added text is noted with underlining and deleted text is noted with strikeout. Only those tables requiring revisions are included below, all other tables in Chapter 4 of the 2008 Final Program EIR did not require any revisions.

5.2 Revised Capital Costs

Capital costs for HST Alignment Alternatives and station location options were estimated in 2006 dollars. The costs are associated with HST-related infrastructure improvements only. The programmed and funded improvements included under the No Project Alternative are assumed to have been implemented by 2020, regardless of proposed HST implementation.

Capital costs were estimated for all proposed HST Alignment Alternatives and station location options evaluated in this Program EIR/EIS (Tables 4.2-1 and 4.2-2 in the 2008 Final Program EIR). Costs also were aggregated for each representative network alternative, as identified in Chapter 2 of the 2008 Final Program EIR and compared in Chapter 7 of the 2008 Final Program EIR. Some alignments (horizontal and vertical) and station configurations previously considered have evolved since preparation of the Statewide Program EIR/EIS, and therefore costs also have changed (Table 5-1). The proposed alignment alternatives and station location options selected in this program review would be further evaluated at the project level to identify cost savings through application of value engineering practices.

The capital costs are representative of all aspects of implementation of the proposed HST system, including construction, right-of-way, environmental mitigation, and design and management services. The construction costs include procurement and installation of line infrastructure (e.g., tracks, bridges, tunnels, grade separations, and power distribution); facilities (e.g., passenger stations and storage and maintenance facilities); systems (e.g., communications and train control); and removal or relocation of existing infrastructure (e.g., utilities and rail tracks). The right-of-way costs include the estimated costs to acquire properties needed for construction of the HST infrastructure. The environmental mitigation costs include a rough estimate of the proportion of the capital cost required for mitigating environmental impacts, based on similar completed highway and rail line construction projects. No specific mitigation costs are identified at this program level of review. Agency costs associated with administration of the program (e.g., design, environmental review, and management) are estimated in terms of add-on percentages to construction costs.

For the San Jose to Central Valley Corridor, the capital cost for traffic mitigation was developed for full reconstruction of 14.3 miles of Monterey Highway between the proposed San Jose Diridon Station and Morgan Hill on an offset alignment.[1] At the program level, the reconstruction of Monterey Highway was

1 The pricing was proportioned for replacement in kind of two and four lane roadway. Pricing used to prepare the composite unit price for reconstruction of Monterey Highway was from Caltrans District 4 2009 actual project bid prices then de-inflated to Year 2006.

estimated to be $118,363,257 in 2006 dollars. The 2008 Final Program EIR accounted for buying a 50-foot right-of-way for the full length from San Jose to Gilroy, so there is no change needed in right-of-way acquisition costs.

As discussed in Chapter 3, the HST alignment in the San Francisco to San Jose Corridor is assumed to be configured in a mix of at-grade, elevated and below grade vertical profiles predominately in the PCJPB right-of-way. There are cities where the available PCJPB right-of-way is known to be particularly narrow (less than 100 feet). Cities that are known to have narrow Caltrain rights-of-way include Millbrae, San Mateo, Redwood City, Atherton, Menlo Park, Palo Alto, Mountain View and Sunnyvale. In these locations, the PCJPB right-of-way would not be sufficiently wide enough to accommodate all four tracks and at the program level would result in the need to acquire up to approximately 10 acres of additional adjacent property at various locations between San Francisco and San Jose. The potential acquisition of 10 acres would increase the total cost of the San Francisco to San Jose section by approximately $16,500,000 in 2006 dollars.

The estimated total capital costs for each individual alignment alternative are presented in Appendix 4-A in the 2008 Final Program EIR. The individual station location costs are presented in Appendix 4-B in the 2008 Final Program EIR.

As defined in Chapter 2 in the 2008 Final Program EIR, the HST Network Alternatives represent different ways to combine HST Alignment Alternatives and station location options to implement the HST system in the study region. The estimated capital costs for each network alternative are presented in Table 4.2-3 in the 2008 Final Program EIR and updated below in Table 5-2 for the Altamont Pass network alternatives, the Pacheco Pass network alternatives, and the Pacheco Pass with Altamont Pass (Local Service) network alternatives. Only the network alternatives that include the San Francisco to San Jose and San Jose to Central Valley corridors show revisions. The breakdown of these costs by the alignment alternatives and alignment segments that comprise each network alternative are presented in Appendix 4-C in the 2008 Final Program EIR.

Because of the variations in alignment alternatives and station location options being considered in the program EIR/EIS process, there is a potential range of capital costs associated with any given network alternative.

The capital costs have been categorized into discrete cost elements. In general, the capital costs were estimated by determining the appropriate unit costs for the identified cost elements and the cost element quantities from conceptual alignment alternative and station location option plans prepared for each alignment alternative (Appendices 2-E, 2-F, and 2-G in the 2008 Final Program EIR). Each cost element is defined in Appendix 4-D in the 2008 Final Program EIR, along with the methods, assumptions, and description of the unit cost applied in each case.

The unit costs were reviewed as part of previous studies by HST owners, operators, and manufacturers, various agencies, and consultants. Formal peer reviews of the Authority's Corridor Evaluation were also conducted. Application of these unit costs and assumptions is consistent with past studies for the HST, including the Business Plan, and provides sufficient detail for the comparison of alignment alternatives and station location options at this program level. The unit costs for all individual elements are presented in Table 4.2-4 in the 2008 Final Program EIR. The unit costs were adjusted to account for inflation from September 2003 to November 2006, based on the Engineering News Record Construction Cost Index Report (McGraw-Hill Construction ENR 2007). Unit costs for the Oakland to San Francisco transbay tube, Dumbarton rail bridge (high-bridge and low-bridge options), and Dumbarton tube were obtained from MTC as part of the Regional Rail planning studies.

5.3 Operations and Maintenance Costs (page 4-19)

No revisions or additions required.

Table 5-1
Revised Table 4.2-1—High-Speed Train Alignment Alternatives Capital Cost (in 2006 dollars), Including Contingencies and Program Implementation Cost

Alignment Alternative by Corridor and Segment	Length		Average Cost (in dollars)		Cost (in dollars)
	Km	Miles	Per Km	Per Mile	
San Francisco to San Jose Corridor: Caltrain					
San Francisco to Dumbarton	44.58	27.70	~~49,175,138~~ 49,341,494	~~79,139,713~~ 79,409,524	~~2,192,227,640~~ 2,199,643,821
Transbay Transit Center to 4th/Townsend (Caltrain 1)	2.50	1.55	159,522,378	256,726,381	398,805,944
4th/Townsend to Millbrae/SFO (Caltrain 2)	22.58	14.03	~~45,352,477~~ 45,370,724	~~72,987,737~~ 73,020,025	~~1,024,058,938~~ 1,024,470,948
Millbrae/SFO to Redwood City (Caltrain 3)	18.75	11.65	~~37,489,586~~ 37,863,142	~~60,333,640~~ 60,938,533	~~702,929,734~~ 709,933,904
Redwood City to Caltrain (Caltrain 4)	0.75	0.47	88,577,366	142,551,453	66,433,025
Dumbarton to San Jose	34.40	21.38	~~39,358,880~~ 39,622,660	~~63,341,977~~ 63,752,082	~~1,353,945,475~~ 1,363,019,506
Caltrain Dumbarton Wye (Caltrain 5)	1.62	1.01	24,593,435	39,579,297	39,865,958
Dumbarton Wye to Palo Alto (Caltrain 6)	5.23	3.25	~~49,783,239~~ 50,561,503	~~80,118,357~~ 81,365,126	~~260,316,558~~ 264,436,659
Palo Alto to Santa Clara (Caltrain 7)	22.55	14.01	~~26,212,143~~ 26,431,829	~~42,184,355~~ 42,543,737	~~591,083,820~~ 596,037,750
Santa Clara to Diridon Station (Caltrain 8)	5.00	3.11	92,535,828	148,921,979	462,679,139
Station Location Options					
Transbay Transit Center (Terminal Option)					786,262,418
4th and King (Caltrain) (Terminal Option)					791,939,278
Millbrae/SFO					29,076,600
Redwood City (Caltrain)					67,516,558
Palo Alto (Caltrain)					67,516,558

Alignment Alternative by Corridor and Segment	Length		Average Cost (in dollars)		Cost (in dollars)
	Km	Miles	Per Km	Per Mile	
San Jose to Central Valley Corridor: Pacheco Pass					
Pacheco	92.50	57.48	~~38,800,727~~ 40,080,330	~~62,443,717~~ 64,499,487	~~3,589,067,255~~ 3,707,430,512
Diridon to Morgan Hill (Pacheco 1)	32.50	20.19	~~20,366,713~~ 22,716,128	~~32,777,047~~ 36,566,328	~~661,918,165~~ 780,281,422
Morgan Hill to Gilroy (Pacheco 2)	16.00	9.94	23,730,117	38,189,921	379,681,864
Gilroy to San Luis Reservoir (Pacheco 3)	44.00	27.34	57,896,982	93,176,161	2,547,467,226
Henry Miller (UPRR Connection)	100.89	62.69	13,489,349	21,709,003	1,360,872,958
San Luis Reservoir to Valley Floor (Pacheco 4)	15.45	9.60	27,554,846	44,345,226	425,722,369
Western Valley to Henry Miller UP Wye (HM-1)	58.05	36.07	10,870,134	17,493,785	630,967,784
Henry Miller UP North Wye to UP South Wye (HM-2)	8.19	5.09	11,200,428	18,025,342	91,720,307
Henry Miller Wye North to UPRR (HM/UP-XN)	11.25	6.99	11,845,555	19,063,573	133,262,493
Henry Miller Wye South to UPRR (HM/UP-XS)	7.95	4.94	9,962,265	16,032,711	79,200,005
Henry Miller (BNSF Connection)	104.70	65.06	13,324,586	21,443,843	1,395,030,861
San Luis Reservoir to Valley Floor (Pacheco 4)	15.45	9.60	27,554,846	44,345,226	425,722,369
Western Valley to Henry Miller UP Wye (HM-1)	58.05	36.07	10,870,134	17,493,785	630,967,784
Henry Miller UP North Wye to UP South Wye (HM-2)	8.19	5.09	11,200,428	18,025,342	91,720,307
Henry Miller UP South Wye to BNSF Wyes (HM-3)	4.62	2.87	11,920,369	19,183,975	55,012,505
Henry Miller Wye North to BNSF (HM/BN-XN)	8.70	5.40	13,137,656	21,143,007	114,245,054
Henry Miller Wye South to BNSF (HM/BN-XS)	9.70	6.03	7,975,551	12,835,405	77,362,843
GEA North	80.25	49.87	16,775,455	26,997,477	1,346,230,241
San Luis Reservoir to Atwater Wye (GEA-1A)	47.70	29.64	12,125,069	19,513,408	578,365,814
GEA Wye to Atwater (GEA-1B)	9.30	5.78	7,483,268	12,043,153	69,594,395
GEA Wye to Arena (SR-99) (GEA XN-1)	10.85	6.74	13,768,794	22,158,725	149,350,104
Arena (SR-99) to Ballico West (GEA XN-2)	8.57	5.33	10,530,597	16,947,353	90,247,214

Alignment Alternative by Corridor and Segment	Length		Average Cost (in dollars)		Cost (in dollars)
	Km	Miles	Per Km	Per Mile	
Arena (SR-99) to Ballico North (GEA XN-3)	9.40	5.84	22,965,148	36,958,823	215,941,283
GEA Atwater Wye South to Merced UP (GEA-UPRR XS)	11.10	6.90	27,186,344	43,752,180	301,768,423
Station Location Options					
San Jose (Diridon)					185,051,790
Morgan Hill (Caltrain)					284,985,295
Gilroy (Caltrain)					148,256,045

Table 5-2
Revised Table 4.2-3—High-Speed Train Network Alternatives Cost Summary (in 2006 dollars)

		Stations	Segment Length		Average Total Cost (dollars)		Cost (dollars)		
No.	**Network Alternative**		**Km**	**Miles**	**Per Km**	**Per Mile**	**Segment**	**Station**	**Total**
A	ALTAMONT PASS								
1	San Francisco and San Jose Termini	S2, S5, S6, S7, S12, S15, S21, S25, S27	327.24	203.34	~~38,880,394~~ 38,903,275	~~62,571,929~~ 62,607,985	~~10,972,862,793~~ 10,980,278,974	1,750,428,628	~~12,723,291,421~~ 12,730,707,602
2	Oakland and San Jose Termini	S3, S5, S9, S10, S15, S21, S25, S27	293.17	182.16	34,208,979	55,054,015	8,575,425,642	1,453,483,850	10,028,909,492
3	San Francisco, Oakland, and San Jose Termini	S2, S3, S5, S6, S7, S9, S10, S15, S21, S25, S27	388.12	241.16	~~38,787,079~~ 38,805,787	~~62,421,753~~ 62,453,566	~~12,717,546,470~~ 12,724,962,651	2,336,339,425	~~15,053,885,895~~ 15,061,302,076
4	San Jose Terminus	S5, S12, S15, S21, S25, S27	257.78	160.18	29,863,432	48,060,536	6,830,741,966	867,573,053	7,698,315,019
5	San Francisco Terminus	S2, S6, S7, S11, S15, S21, S25, S27	308.27	191.55	~~35,729,340~~ 35,753,861	~~57,500,799~~ 57,540,291	~~9,295,774,550~~ 9,303,190,731	1,718,652,058	~~11,014,426,607~~ 11,021,842,789
6	Oakland Terminus	S3, S9, S10, S15, S21, S25, S27	274.97	170.86	29,700,584	47,798,456	6,898,337,399	1,268,432,060	8,166,769,459
7	Union City Terminus	S10, S15, S21, S25, S27	254.16	157.93	23,423,990	37,697,258	5,357,942,113	595,499,153	5,953,441,266
8	San Francisco, and San Jose—via SF Peninsula	S2, S5, S6, S8, S11, S15, S21, S25, S27	343.27	213.30	~~36,606,277~~ 36,654,742	~~58,912,092~~ 58,989,860	~~10,662,279,160~~ 10,678,769,372	1,903,703,848	~~12,565,983,007~~ 12,582,473,220
9	San Francisco, San Jose, and Oakland—with no San Francisco Bay Crossing	S2, S3, S5, S6, S7, S9, S10, S15, S21, S25, S27	393.81	244.70	~~36,713,165~~ 36,754,852	~~59,084,112~~ 59,151,730	~~12,121,598,757~~ 12,138,088,969	2,336,339,425	~~14,457,938,182~~ 14,474,428,394
10	Oakland, and San Francisco—via Transbay Tube	S2, S3, S9, S10, S15, S21, S25, S27	289.11	179.64	44,670,632	71,890,413	10,860,031,797	2,054,694,478	12,914,726,275
11	San Jose, Oakland and San Francisco—via Transbay Tube	S2, S3, S5, S9, S10, S15, S21, S25, S27	320.44	199.11	46,114,588	74,214,235	12,537,120,041	2,239,746,268	14,776,866,308
P	PACHECO PASS								
1	San Francisco and San Jose Termini	S2, S5, S6, S8, S23, S26, S27	430.55	267.53	~~28,771,881~~ 28,084,758	~~46,303,853~~ 46,807,621	~~11,028,569,783~~ 11,163,423,252	1,359,019,515	~~12,387,589,298~~ 12,522,442,767

		Stations	Segment Length		Average Total Cost (dollars)		Cost (dollars)		
No.	**Network Alternative**		**Km**	**Miles**	**Per Km**	**Per Mile**	**Segment**	**Station**	**Total**
2	Oakland and San Jose Termini	S3, S5, S9, S10, S23, S26, S27	413.40	256.87	~~27,973,967~~ 28,259,945	~~45,019,736~~ 45,480,832	~~10,345,348,109~~ 10,463,711,366	1,218,949,918	~~11,564,298,026~~ 11,682,661,284
3	San Francisco, Oakland and San Jose Termini	S2, S3, S5, S6, S8, S9, S10, S23, S26, S27	498.26	309.60	~~32,098,678~~ 32,369,005	~~51,657,815~~ 52,093,605	~~13,891,521,223~~ 14,026,374,692	2,101,805,493	~~15,993,326,716~~ 16,128,180,185
4	San Jose Terminus	S5, S23, S26, S27	343.04	213.15	~~23,200,433~~ 23,545,137	~~37,337,478~~ 37,893,145	~~7,482,396,668~~ 7,600,759,925	476,163,940	~~7,958,560,608~~ 8,076,923,865
5	San Jose, San Francisco and Oakland—via Transbay Tube	S2, S3, S5, S6, S7, S23, S26, S27	444.69	276.31	~~38,140,438~~ 38,443,262	~~61,381,085~~ 61,870,125	~~14,990,264,181~~ 15,125,117,650	1,970,216,570	~~16,960,480,751~~ 17,095,334,220
6	San Jose, Oakland and San Francisco—via Transbay Tube	S2, S3, S5, S9, S10, S23, S26, S27	427.54	265.66	~~38,154,198~~ 38,430,599	~~61,403,229~~ 61,848,295	~~14,307,042,507~~ 14,425,405,764	2,005,212,335	~~16,312,254,842~~ 16,430,618,099
PA	PACHECO PASS WITH ALTAMONT PASS (LOCAL SERVICE)								
1	San Francisco and San Jose Termini	S2, S5, S6, S8, S23, S25, S27, S29, S32, S38	545.83	339.16	~~33,558,079~~ 33,804,956	~~54,006,494~~ 54,404,291	~~16,299,474,324~~ 16,434,327,793	2,017,431,430	~~18,316,905,754~~ 18,451,759,223
2	Oakland and San Jose Termini	S3, S5, S9, S10, S23, S25, S27, S32, S38	512.50	318.45	~~31,135,039~~ 31,366,052	~~50,106,988~~ 50,479,202	~~14,379,523,442~~ 14,497,886,699	1,577,215,168	~~15,956,738,609~~ 16,075,101,867
~~3~~	~~San Francisco, Oakland and San Jose Termini (with Dumbarton Bridge)~~	~~S2, S3, S5, S6, S8, S9, S10, S23, S25, S27~~	~~629.32~~	~~391.04~~	~~34,942,461~~	~~56,234,439~~	~~19,888,148,879~~	~~2,101,805,493~~	~~21,989,954,371~~
3	San Francisco, Oakland and San Jose Termini (without Dumbarton Bridge)	S2, S3, S5, S6, S8, S9, S10, S23, S25, S27, S32, S38	580.81	360.90	~~35,098,797~~ 35,331,039	~~56,486,038~~ 56,859,575	~~17,925,696,556~~ 18,060,550,025	2,460,070,743	~~20,385,767,299~~ 20,520,620,768
4	San Jose Terminus	S5, S12, S23, S25, S27, S32, S38	460.34	286.04	~~29,237,801~~ 29,494,732	~~47,053,679~~ 47,467,504	~~12,467,937,131~~ 12,586,300,388	991,304,370	~~13,459,241,501~~ 13,577,604,758